Listing of Claims

This Listing of Claims will replace all prior version, and listings, of claims in the Application.

1-60. (CANCELED)

61. (NEW) A method for determining coordinates of a feature comprising:

providing a first image including the feature, the first image comprising a plurality of pixels;

determining a first estimate of coordinates of the feature to within a fraction of a pixel;

translating the feature by a pixel translation value, wherein the sum of the pixel fraction and pixel translation value is an integer value;

determining a second estimate of coordinates of the translated feature to within a fraction of a pixel; and

summing the pixel fractions of the first estimate with the second estimate to derive a refined estimate of coordinates.

62. (NEW) The method according to claim 61, wherein each of the first and second determining steps comprise:

correlating the feature and the image using a predetermined correlation function to determine coordinates of the feature to the nearest pixel;

evaluating the correlation function at a plurality of pixel positions in the neighborhood of the determined coordinates to provide a plurality of values;

fitting the plurality of values to a further function; and

differentiating the further function to determine its turning point, whereby coordinates corresponding to the turning point provide coordinates of the feature.

63. (NEW) The method according to claim 62, wherein the correlation function is evaluated at a plurality of sub-pixel positions.

64. (NEW) The method according to claim 63, wherein the sub-pixel positions are closer in proximity to the determined coordinates than the pixel positions.

65. (NEW) The method according to claim 61 further comprising:

determining coordinates of the feature within a second image, the position of the second image being known relative to the first image;

determining the difference in position of the feature between the first image and the second image;

superimposing the first image and the second image to provide a superimposed image, wherein the feature is substantially in registration; and

applying a Super Resolution technique to the superimposed image to provide an increased resolution representation of the feature.

66. (NEW) The method according to claims 62, wherein the predetermined correlation function is a normalized greyscale correlation function.

67. (NEW) The method according to claim 61, wherein the translating step, second determining step and summing step are repeated at least once.

68. (NEW) The method of claim 61, wherein the method provides for measuring dimensional changes in an object, wherein measuring dimensional changes in the object include:

capturing at least one first image and at least one second image of the object, each image being captured at a different time with respect to the other;

determining the position of the object within each image in accordance with the method of claim 61; and

comparing the determined positions of the object to determine dimensional changes.

69. (NEW) An apparatus for determining a position of an object comprising:

an image capture device arranged to provide a captured image encompassing the object, the captured image comprising a plurality of pixels; and

an image processor arranged to receive the captured image and determine the position of the object by executing the method of claim 61.

70. (NEW) The apparatus according to claim 69 further comprising:

a monitor arranged to receive and display the captured image; and

an object selection means arranged to select a further object within the displayed image and to identify the further object to the image processor.

71. (NEW) An apparatus for determining a position of an object comprising:

an image capture device arranged to sequentially provide a plurality of captured images of an object, each captured image having a plurality of pixels;

an image processor arranged to sequentially receive the plurality of captured images and determine the position of the object from the plurality of captured images by executing the method of claim 61; and

a position comparator arranged to compare the determined position of the object for the plurality of captured images and identify whether the determined position changes in the plurality of captured images.

72. (NEW) The apparatus according to claim 71 further arranged to determine the change in the determined position, the change selected from the group consisting of magnitude, direction, and combinations thereof.

73. (NEW) A method for determining coordinates of a feature comprising:

providing at least two image capture devices each arranged to capture an image including the feature;

determining a position of the at least two image capture devices with respect to the other;

determining coordinates of the feature in accordance with the method of claim 61; and

calculating a 3-dimensional coordinate of the feature given the determined coordinates of the feature and the determined position of the at least two image capture devices.

74. (NEW) A method for determining a position of an object comprising:

providing at least two image capture devices at a known spatial relationship to one another;

capturing at least two images of the object with each image capture device, the at least two images being captured at a different time from the other;

determining the 2-dimensional position of the object within the at least two images in accordance with the method of claim 61;

calculating the 3-dimensional position of the object from the 2-dimensional position for the at least two images and the spatial relationship of the at least two image capture devices; and

comparing each 3-dimensional position to determine a dimensional change in the object.

75. (NEW) The apparatus according to claim 69 further comprising:

at least one further image capture device at a known spatial relationship to the image capture device, wherein the image processor is further arranged to determine the position of the object in each captured image and, given the known spatial relationship of each image capture device, determine the 3-dimensional position of the object.

76. (NEW) The measurement apparatus according to claim 71 further comprising:

at least one further image capture device at a known spatial relationship to the image capture device, wherein the image processor is further arranged to determine the position of the object in each captured image and, given the known spatial relationship of each image capture device, determine the 3-dimensional position of the object.

77. (NEW) A method for determining coordinates of a feature comprising:

providing at least one image including the feature, the at least one image comprising a plurality of pixels;

correlating the feature and the at least one image using a predetermined correlation function to determine coordinates of the feature to the nearest pixel;

evaluating the correlation function at a plurality of sub-pixel positions in the neighborhood of the determined coordinates to provide a plurality of values and fitting the plurality of values to a further function; and

differentiating the further function to determine its maximum, whereby coordinates corresponding to the maximum are coordinates of the feature to within a fraction of a pixel.

78. (NEW) A method for monitoring an aircraft structure comprising the steps of:

attaching one or more image captures devices to a first portion of an aircraft structure;

attaching one or more targets to a second portion of the aircraft structure, the one or more targets being within a field of view of the one or more image capture devices;

capturing a series of images from the one or more image capture devices; and

processing the series of images to determine movement of the one or more targets.

79. (NEW) The method according to claim 78, wherein said method includes attaching at least three targets to a second portion of the aircraft structure at known positions relative to the second portion of the aircraft, the at least three targets being within the field of view of the one or more image capture devices, wherein the position of the second portion of the aircraft is determined by processing the series of images to determine the movement of one or more targets relative to the one or more image capture devices, wherein movement is selected from the group consisting of magnitude, direction and combinations thereof.

80. (NEW) The method according to claim 78, wherein the one or more targets is orthogonally offset from the plane of the second portion of aircraft structure to which it is attached.

81. (NEW) The method according to claim 78, wherein a reflective surface is attached to the aircraft structure such that the one or more targets is within the field of view of the one or more image capture devices when viewed through the reflective structure.

82. (NEW) The method according to claims 78, wherein the one or more image capture devices is arranged to automatically identify the one or more targets as an item of interest.

83. (NEW) The method according to claims 78, wherein the processing step includes the method of claim 61.

84. (NEW) The method according to claim 78, wherein the aircraft structure is selected from the group consisting of a portion of a wing, empennage, and fuselage.

85. (NEW) An apparatus for monitoring an aircraft structure comprising:

at least one image capture device arranged to be attached to a first portion of the aircraft structure;

at least one target arranged to be attached to a second portion of the aircraft structure, whereby the at least one target is within the field of view of the at least one image capture device; and

an image processor arranged to receive a plurality of images from the at least one image capture device and to process the plurality of images to determine movement of the at least one target, wherein movement is selected from the group consisting of magnitude, direction, and combinations thereof.

86. (NEW) The apparatus according to claim 85, wherein the at least one target is arranged to be attached in a plane orthogonally offset from the plane in which the at least one target is arranged to be attached.

87. (NEW) The apparatus according to claim 85, wherein a reflective element is arranged to be attached to the second portion of the aircraft structure such that the at least one target is within the field of view of the at least one image capture device when viewed through the reflective surface.

88. (NEW) The apparatus according to claim 85, wherein the image processor is arranged to automatically identify the at least one target.

89. (NEW) The apparatus according to claim 85, wherein the at least one target is an illuminated panel including areas of differential illumination.